Investigation of efficiency of activated carbon prepared from filamentous algae magnetite by Fe_3O_4 nanoparticles in removal of Basic Blue 41 from aqueous solutions

Abstract

Background: Azo dyes including the asic blue 41 dye, due to their aromatic rings, toxicity, mutagenesis, carcinogenicity and persistence, are considered to be a major risk to humans and the environment. The Algae Activated Carbon/Fe_3O_4 nanoparticle (AC/Fe_3O_4) composite was produced by adding $ZnCL_2$ as activator agent for algae to prepare a novel adsorbent for removal of Basic Blue 41 (BB 41) dye from aqueous solution. .

Methods: The microstructure and properties of the AC/Fe_3O_4 composite were studied by pH_{PZC}, FT-IR, FESEM/EDX, XRD, BET and VSM techniques. The effect of parameter such as: pH of the solution (3-9), the initial concentration of BB 41 dye (50-200 mg/L), and adsorbent dosage (0.1-2 g/L) on removal efficiency were investigated during the equilibrium and kinetics studies.

Finding: The optimum conditions for maximum removal of dye at pH: 9, contact time: 90 min, adsorbent dosage: 1 g/L and initial concentration of dye: 100 mg/L were obtained. The study of isotherms and Kinetics indicated that the experimental data are fitted to Langmuir and second-pseudo-order models. Under the optimum conditions, maximum adsorption capacity of the AC/Fe_3O_4 composite in Langmuir model enhanced to amount of 135 mg/g.

Conclusion: This study shows that the AC/Fe_3O_4 can be applied as a novel-adsorbent for the removal of dye from aqueous solutions.

Keywords: Adsorption, Activated Carbon of Algae (AC), Fe_3O_4 nanoparticle, Basic Blue 41, isotherm, kinetics